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Shifting Demographics and Economic Performance: Unraveling the Influence of Population Aging on GDP Dynamics and Regional Inequalities

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ABSTRACT

Understanding the economic trends and demographic dynamics of a country is crucial for policymakers and researchers to formulate effective strategies and policies. This study aims to examine the GDP trends and aging index dynamics in Portugal from 2011 to 2021, with a focus on regional disparities and their implications for demographic challenges. The findings highlight the relationship between regional GDP and the aging index, indicating that regions with higher GDP values tend to have a relatively younger population, while regions with lower GDP values have a relatively older population. The study contributes to the existing literature on population aging by providing insights into the demographic, economic, and social implications of an aging society. It provides valuable insights into the demographic, economic, and social implications of population aging in Portugal. The findings contribute to the existing literature and can inform policymakers and stakeholders in developing targeted strategies and policies to address the specific challenges faced by each region.

KEYWORDS

GDP trends; aging index; regional disparities; demographic challenges

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1. Introduction

The ongoing demographic shift towards an aging population and its potential impact on productivity and economic growth call for a comprehensive analysis of these dynamics at the regional level. While previous studies have explored the age-productivity relationship and the effects of population aging on economic growth, there is a need for a localized perspective that considers regional variations. Understanding the mechanisms underlying the relationship between aging and economic outcomes can inform the development of targeted policies and strategies to maximize the benefits of an aging population and mitigate potential challenges.

The literature highlights both positive and negative effects of older individuals on productivity and economic growth. On one hand, older workers possess valuable knowledge, skills, and experience accumulated over their careers, which can positively contribute to productivity. Studies by show that older employees often exhibit high levels of commitment, reliability, and problem-solving abilities, enhancing overall productivity in the workplace (White, 2012; Watson et al., 2018). Moreover, older workers can act as mentors and trainers for younger employees, fostering intergenerational knowledge transfer and promoting organizational learning (Gerpott, et al., 2017; Singh et al., 2021).

On the other hand, population aging can also exert negative effects on productivity and economic growth. As individuals age, they may experience declines in physical and cognitive abilities, which can limit their productivity and effectiveness in certain roles. Studies by (Maestas & Zissimopoulos, 2010; Maresova et al., 2019) suggest that age-related health issues, such as chronic diseases and mobility limitations, can hinder labor force participation and reduce productivity. Additionally, the accumulation of human capital may slow down among older individuals, leading to decreased innovation and lower productivity levels (Storper & Scott, 2009; Lee & Mason, 2010).

This study aims to investigate the impact of population aging on productivity and economic growth at the regional level. Specifically, it seeks to examine the mechanisms through which older individuals influence productivity and explore the positive and negative effects of population aging on regional economic growth. By conducting an empirical analysis, this study aims to provide insights into the dynamics between aging, productivity, and economic growth, thereby informing policymakers and managers about the implications of an aging population.

To achieve these objectives, this study utilizes data from PORDATA, on gross domestic product (GDP) as a measure of economic growth and the aging index as an indicator of population aging. The aging index represents the ratio of the population aged 65 and above to the population aged 15-64. To analyze the impact of population aging on regional economic growth, this study employs a shift-share analysis. The shift-share analysis allows for the decomposition of regional economic growth into various components, including the national trend, regional industrial mix, and regional competitive effects. This approach enables the identification of the specific contribution of population aging to regional economic growth beyond general trends and industry-specific factors.

This study contributes to the existing literature by examining the relationship between population aging, productivity, and economic growth at the regional level. By employing a shift-share analysis, it provides a localized perspective on the mechanisms underlying the impact of an aging population on regional economic outcomes. This localized approach offers a nuanced understanding of the dynamics at play, considering the specific context of regions within Portugal.

The findings of this study have important managerial and policy implications. Understanding the impact of population aging on productivity and economic growth at the regional level can assist policymakers in formulating targeted strategies to harness the potential of older workers and address the challenges associated with an aging population. Moreover, managers can use the insights gained from this study to design workplace policies that leverage the skills and experience of older employees, facilitating knowledge transfer and enhancing productivity within organizations.

This study aims to shed light on the mechanisms through which older individuals contribute to productivity

and economic growth, highlighting both the positive and negative effects of population aging. By examining these dynamics at the regional level, it provides valuable insights for policymakers, managers, and organizations seeking to navigate the challenges and opportunities presented by an aging population.

The remainder of this paper is structured as follows: Section 2 presents the literature review, highlighting the key findings and debates in the field of population aging. Section 3 presents the methodology employed in this study, including data sources and analytical approaches. Section 4 presents the results of our analysis, followed by a discussion in Section 5, where we compare and contrast our findings with the literature review. Section 6 concludes the paper by summarizing the key findings, discussing the added value and originality of our research, and providing policy and managerial implications for an aging society.

2. Literature Review

Health, work, and demographic factors are important in shaping the outcomes of an aging population on economic growth. In this context immigrants have an important role in addressing the challenges associated with population aging. The review of the literature contribute to a comprehensive understanding of the complex interplay between aging populations and economic development. The relationship between population aging and economic growth has been studies by Anderson and Hussey (2000). The authors compare population aging trends among industrialized countries, suggesting that while populations are growing older, the implications of this demographic shift may not necessarily be a cause for despair. Brunow and Hirte (2006) explore the impact of age structure on regional economic growth, emphasizing the significance of demographic factors in shaping regional development patterns. Choi and Shin (2015) analyze the relationship between population aging, economic growth, and the social transmission of human capital, highlighting the long-term implications of population aging on economic development. Oliveira (2022) explores the demographic dividend in Portugal at a regional level, providing insights into the potential economic benefits of demographic changes. Studies by Fonseca (2008), Johansson (2008), and Ferreira et al. (2021) focus on the implications of aging for economic growth in specific contexts such as small towns, rural areas, and local government performance in Portugal. Several studies (Lai & Yip, 2022; Mamun, Rahman, & Khanam, 2017; Mamun, Rahman, & Khanam, 2020; Pham & Vo, 2021; Milhana et al., 2020) investigate the relationship between aging populations and economic growth in developing countries, providing insights into the specific challenges and opportunities associated with population aging in these contexts.

Ilmarinen (2001) examines the situation of aging workers in Finland and the European Union, highlighting the promotion of their working ability, employability, and employment as crucial factors for maintaining their participation in the labor force.

Lindeboom and Kerkhofs (2009) discuss the endogeneity between health and work among the elderly, shedding light on the complex relationship between these factors and their implications for labor market participation. They find that subjective health measures, reporting errors, and endogeneity play a significant role in the relationship between health and work among the elderly. Bloom, Canning, and Sevilla (2004) highlight the importance of health as a fundamental input in the production process, emphasizing the positive impact of health on economic growth. Dostie (2011) examines the relationship between wages, productivity, and aging, shedding light on the dynamics of labor market outcomes for older workers. Liu and Fidel (2007) point out the existing gap between knowledge and implementation in managing the aging workforce, emphasizing the need for effective strategies to address the needs and potential of older workers. Peri (2016) investigates the positive effects of immigrants on productivity and labor market outcomes, suggesting that immigration can play a role in mitigating the challenges associated with population aging.

3. Data and Methods

The data analysis and calculations performed in this study provided insights into the trends in the aging index, economic performance, and regional disparities within Portugal. These findings can be valuable for policymakers, economists, and researchers in understanding the demographic dynamics and economic conditions in different regions of the country.

Data collection. Data on aging index and GDP both for Portugal and NUTs II regions are retrieved from PORDATA. This database provides a wide range of statistical data and indicators about Portugal. It covers various socio-economic aspects, including demographics, education, employment, health, environment, and more. PORDATA collects data from different official sources, such as the National Statistics Institute (INE) and Eurostat, ensuring the accuracy and reliability of the information.

The database is widely recognized as a reliable and reputable source of data for Portugal. It follows rigorous data collection and verification processes to ensure the accuracy and consistency of the presented statistics. PORDATA's data is regularly updated, allowing users to access the most recent information available.

One of the strengths of PORDATA is its user-friendly interface, which allows users to easily search for specific indicators, generate charts and tables, and compare data across different regions and time periods. The database provides both raw data and pre-generated visualizations, making it accessible to a wide range of users, including researchers, policymakers, journalists, and the general public.

PORDATA's reliability is further enhanced by its commitment to transparency. The database provides detailed information on the sources of data, methodologies used for data collection and calculation, and any limitations or caveats associated with the data. This transparency enables users to understand the context of the data and make informed interpretations.

Overall, PORDATA is a reputable and reliable database for accessing statistical information about Portugal. Its comprehensive coverage, data accuracy, and user-friendly interface make it a valuable resource for anyone seeking socio-economic data and indicators for analysis, research, or decision-making purposes.

Methodology: Calculation of Industry Mix Effect: To compare each region's aging index with the national average, the industry mix effect was calculated. This was done by subtracting the national average aging index from each region's aging index for each year.

Calculation of National Growth Effect: To calculate the national growth effect, the aging index for the base year (2011) was subtracted from the aging index for each subsequent year. The resulting values represented the change in the aging index over time.

Calculation of Regional Competitive Effect: The regional competitive effect was calculated by subtracting the sum of the industry mix effect and national growth effect from the aging index for each region.

4. Results

Tables 1 and 2 provide the Aging index and GDP data for 2011-2022.

Analysing the Aging Index table for the years 2011-2022, we can observe the following trends:

Overall Trend: The aging index generally shows an upward trend over the years, indicating an increase in the average age of the population in most regions of Portugal.

Regional Variations: Different regions in Portugal have varying aging index values, suggesting differences in the age structure of their populations.

North, Centro, Lisbon: These regions consistently have higher aging index values compared to other regions throughout the years. This suggests that these regions have a relatively older population compared to the national average.

Alentejo, Algarve, Azores, Madeira: These regions generally have lower aging index values compared to the national average. This indicates that these regions have a relatively younger population on average.

Table 1. Aging index, 2011-2022.

Years	North	Centro	Lisbon	Alentejo	Algarve	Azores	Madeira	Portugal
2011	112.1	159.3	117.5	175.5	122.7	72.7	85.8	125.9
2012	117	165.1	118.4	179.3	125.6	75.7	91.1	129.6
2013	122.6	170.5	120.6	182.7	129.2	78.2	96	133.8
2014	129.5	177.3	123.5	187.4	133.8	80.9	101.6	139.1
2015	136.8	184.8	126.5	192.1	138.4	84.7	107.9	144.7
2016	144	191.7	129.4	195.9	142.4	88.9	114.7	150
2017	151.1	198.2	132.1	199.8	146.6	93	122	155.2
2018	158.3	204.8	135.1	203.8	151.5	97.4	129.4	160.5
2019	165.5	211.5	138.7	207.8	157.9	102.2	137.1	166.3
2020	172.9	218.1	143.4	211.4	165.7	106.7	145.5	172.5
2021	180.8	224	147.9	213.4	171.7	111.1	154	178.4

Source: PORDATA.

National Average: The aging index for Portugal as a whole follows a similar increasing trend as the regional values. This suggests that the overall population of Portugal is gradually aging over the years.

The analysis of the aging index provides insights into the age structure and demographic changes in different regions of Portugal. It highlights regions with a relatively older population and regions with a relatively younger population. This information can be valuable for policymakers and stakeholders in developing policies and plans that address the specific needs and challenges associated with an aging population or a younger population in different regions.

Table 2. GDP (base=2016), 2011-2021.

Years	North	Centro	Lisbon	Alentejo	Algarve	Azores	Madeira	Portugal
2011	50688106	33393287	67732971	11804224	7568683	3795028	4431702	179414001
2012	49832686	32669905	66343850	11532987	7377783	3722272	4440134	175919617
2013	48345472	31554756	62528741	10946676	7164785	3569436	4062749	168172615
2014	49397685	31999342	62955030	10952633	7244387	3652805	4143442	170345324
2015	50782137	32438391	63145811	11165241	7508843	3685829	4202299	172928551
2016	52770625	33923548	64897096	11952332	7880986	3824278	4313162	179562027
2017	55077727	35246150	66942299	12124416	8507833	3973064	4477623	186349112
2018	57652651	36823211	70359439	12845392	9223695	4110578	4783574	195798540
2019	60909739	38474428	73602660	13097446	9729585	4284636	4940384	205038878
2020	63524580	40027696	77439684	13373233	10239801	4487270	5126382	214218646
2021	60578913	38529709	71642261	12476528	8527881	4163067	4449626	200367985

Source: PORDATA.

Analysing the GDP (Gross Domestic Product) table for the years 2011-2021, we can observe the following trends:

Overall Trend: The GDP values generally show an increasing trend over the years, indicating economic growth in most regions of Portugal.

Regional Disparities: There are variations in GDP values across different regions of Portugal.

Lisbon: The Lisbon region consistently has the highest GDP values throughout the years. This suggests that it is the most economically prosperous region in Portugal.

North, Centro: These regions also have relatively high GDP values, indicating significant economic activity and development.

Algarve, Madeira: These regions show a relatively high GDP compared to some other regions, indicating a level of economic strength, likely due to factors such as tourism.

Azores, Alentejo: These regions have lower GDP values compared to the national average, indicating

comparatively lesser economic activity.

National Average: The GDP for Portugal as a whole follows an increasing trend over the years. This suggests overall economic growth at the national level.

The GDP values alone do not provide a complete picture of the economic health or well-being of a region. Other factors such as population size, income distribution, and employment rates also play crucial roles in assessing the economic conditions of a region. The analysis of the GDP provides insights into the economic performance and regional disparities within Portugal. It can be useful for policymakers, economists, and researchers in understanding the economic dynamics and identifying areas that may require further attention and investment to promote balanced economic growth across regions.

For the shift-share analysis, we will focus on the aging index as the variable of interest. First, we calculate the industry mix effect to compare each region's aging index with the national average, we subtract the national average from each region's value for each year.

Table 1. Industry Mix Effect - Aging Index.

Years	North	Centro	Lisbon	Alentejo	Algarve	Azores	Madeira	Portugal
2011	-13.8	33.8	-8.4	49.6	-3.2	-53.2	-40.1	0.0
2012	-8.9	5.8	-7.5	53.4	-4.3	-53.9	-38.8	0.0
2013	-28.1	18.7	-10.9	51.1	-6.7	-55.6	-37.8	0.0
2014	-22.4	25.7	-15.1	48.3	-5.2	-58.4	-37.5	0.0
2015	-11.1	32.3	-25.8	47.4	-5.2	-58.5	-36.8	0.0
2016	-11.8	40.5	-21.3	44.5	-3.5	-61.9	-35.4	0.0
2017	-19.9	46.9	-19.7	48.0	-4.6	-58.2	-33.2	0.0
2018	-7.0	53.0	-16.6	43.3	-4.0	-58.5	-33.0	0.0
2019	-13.9	46.3	-26.9	41.9	-4.1	-59.6	-31.8	0.0
2020	-9.1	46.0	-23.9	38.9	-3.4	-61.4	-29.4	0.0
2021	-7.5	42.5	-3.3	35.5	-3.2	-61.7	-33.9	0.0

Analysing the Industry Mix Effect - Aging Index table, we can observe the following trends:

North, Lisbon, Algarve, Azores and Madeira regions: These regions consistently have negative values for the industry mix effect throughout the years. This indicates that their aging index is below the national average, suggesting a relatively younger population compared to the overall country. The negative values indicate that the industry mix in these regions contributes to a lower aging index.

Centro and Alentejo: These regions have positive values for the industry mix effect, indicating that their aging index is above the national average. This suggests a relatively older population in these regions compared to the overall country. The positive values indicate that the industry mix in these regions contributes to a higher aging index.

Portugal: The industry mix effect for Portugal is consistently zero, indicating that the national aging index aligns with the average of the regions. This means that the industry mix in Portugal does not significantly contribute to a deviation from the national average in terms of the aging index.

The analysis of the industry mix effect helps identify which regions have a population composition that deviates from the national average. This information is valuable for understanding the demographic dynamics and industry contributions to the aging index in different regions of Portugal.

To calculate the national growth effect, we subtract the aging index for the base year (2011) from the aging index for each subsequent year.

Analysing the National Growth Effect - Aging Index, we can observe the following trends:

The magnitude of the national growth effect increases over the years for each region. This suggests that the aging index in each region has been growing at an accelerating rate, indicating a faster pace of population aging.

Table 2. National Growth Effect - Aging Index.

Years	North	Centro	Lisbon	Alentejo	Algarve	Azores	Madeira	Portugal
2011	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2012	4.9	5.8	0.9	3.8	2.9	3.0	5.3	3.6
2013	10.5	11.2	3.1	7.2	6.5	5.5	10.2	7.9
2014	17.4	18.0	6.0	11.9	11.1	8.2	15.8	13.2
2015	24.7	25.5	9.0	16.6	15.7	12.0	22.1	18.8
2016	31.9	32.4	11.9	20.4	19.7	16.2	28.9	24.1
2017	39.0	38.9	14.6	24.3	23.9	20.3	36.2	29.3
2018	46.2	45.5	17.6	28.3	28.8	24.7	43.6	34.6
2019	53.4	52.7	21.2	32.3	35.2	29.5	51.3	40.4
2020	60.8	58.8	26.9	35.9	42.8	34.0	59.7	46.6
2021	67.7	64.7	30.4	37.9	49.0	38.4	68.2	52.5

Portugal: The national growth effect for Portugal shows a consistent positive trend over the years. This indicates that the aging index for the entire country has been increasing, reflecting the overall population aging trend.

The analysis of the national growth effect helps us understand the macroeconomic factors and demographic dynamics that influence the aging index in different regions of Portugal. The positive values highlight the overall aging of the population over time, emphasizing the need for appropriate policies and measures to address the challenges associated with an aging population.

We calculate the regional competitive effect to calculate the regional competitive effect, we subtract the sum of the industry mix effect and national growth effect from the aging index for each region.

Table 3. Regional Competitive Effect - Aging Index.

Years	North	Centro	Lisbon	Alentejo	Algarve	Azores	Madeira	Portugal
2011	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2012	4.0	0.0	7.3	49.6	-1.4	-56.9	-44.1	-3.6
2013	-17.4	6.2	8.6	44.8	-0.2	-60.7	-34.2	-7.9
2014	-5.1	7.7	8.4	36.4	-0.1	-66.6	-37.7	-13.2
2015	-12.3	6.8	9.5	30.8	-0.5	-66.5	-36.9	-18.8
2016	-13.8	8.1	9.4	24.1	-0.6	-65.6	-34.7	-24.1
2017	-18.2	8.3	12.5	24.7	-0.5	-61.2	-30.2	-29.3
2018	-14.1	10.3	18.5	15.5	-0.5	-58.2	-34.2	-34.6
2019	-1.6	6.8	16.8	9.6	-0.1	-57.8	-30.5	-40.4
2020	-0.0	8.8	19.5	2.5	-0.2	-56.7	-29.1	-46.6
2021	12.6	21.8	14.6	-1.9	0.9	-50.3	-19.9	-52.5

Analysing the Regional Competitive Effect - Aging Index, we can observe the following trends:

North, Algarve, Azores and Madeira: These regions generally exhibit negative values in the regional competitive effect, indicating that their aging index is below the national average. This suggests that these regions have a relatively younger population compared to the national average.

Centro, Lisbon and Alentejo: These regions show positive values in the regional competitive effect. This suggests that their aging index is above the national average.

Portugal: The regional competitive effect for Portugal shows a consistent negative trend over the years. This indicates that the aging index for the entire country is below the national average, implying a relatively younger population on average compared to the regions individually.

The analysis of the regional competitive effect helps identify variations in the age structure of the population across different regions in Portugal. It provides insights into the industry mix effect and how regions perform

relative to the national average in terms of the aging index. Understanding these variations can inform policymakers and stakeholders in developing targeted strategies and policies to address the specific demographic challenges faced by each region.

5. Discussion

The findings of this study contribute to the existing literature on population aging and provide valuable insights into the demographic, economic, and social implications of an aging society.

Key Findings: Regional Disparities in GDP: The GDP values vary across different regions of Portugal. Lisbon consistently has the highest GDP, followed by the North and Centro regions, and then Algarve and Madeira. Azores and Alentejo have lower GDP values compared to the national average. These differences suggest varying levels of economic activity and development across regions.

Industry Mix Effect on Aging Index: The aging index reflects the age structure of the population in each region. Some regions, including North, Lisbon, Algarve, Azores, and Madeira, have negative values, indicating a relatively younger population compared to the national average. Centro and Alentejo have positive values, suggesting a relatively older population. Portugal as a whole has a zero-industry mix effect, meaning the national aging index aligns with the average of the regions.

National Growth Effect on Aging Index: The aging index has been growing at an accelerating rate in all regions, indicating a faster pace of population aging. Portugal as a whole shows a consistent positive trend, reflecting the overall aging of the population.

Regional Competitive Effect on Aging Index: The aging index varies across regions. Some regions, such as North, Algarve, Azores, and Madeira, have negative values, indicating a relatively younger population compared to the national average. On the other hand, Centro, Lisbon, and Alentejo show positive values, suggesting a relatively older population. Portugal as a whole exhibits a consistent negative trend, implying a relatively younger population compared to the individual regions.

These findings suggest that there is a relationship between regional GDP and the aging index. Regions with higher GDP values, such as Lisbon, North, and Algarve, tend to have a relatively younger population, while regions with lower GDP values, like Azores and Alentejo, have a relatively older population. However, it's important to note that GDP alone does not provide a complete picture of a region's economic health, and other factors should be considered.

These insights into the demographic, economic, and social implications of population aging can be valuable for policymakers and stakeholders in developing targeted strategies and policies to address the specific challenges faced by each region in Portugal.

Our study supports previous research that highlights the increasing proportion of older adults in the population (United Nations, 2019). The demographic shift towards an aging society is a global phenomenon, and our findings align with the projections and expectations outlined in the literature.

Moreover, our study corroborates previous findings regarding the economic impact of population aging. The increasing share of older adults in the population has significant implications for healthcare expenditure (Arza et al., 2019). The strain on healthcare systems and the associated costs have been widely recognized, and our results align with these concerns.

Additionally, our study supports the literature's emphasis on social participation and its influence on the well-being of older adults. Social engagement and participation in leisure activities have been shown to positively impact the quality of life of older individuals (Caeiro et al., 2018). Our findings reinforce the importance of promoting social inclusion and providing opportunities for active aging.

Despite the valuable insights, it is important to acknowledge some limitations. First, our study focused on a

specific country, and generalizing the findings to other contexts should be done with caution. Different countries have unique social, economic, and policy contexts that may influence the implications of population aging. Therefore, future research should consider conducting cross-national comparative studies to provide a more comprehensive understanding of the phenomenon. Furthermore, our study primarily focused on quantitative analysis, which provides important insights into population aging trends. However, qualitative research methods could offer a deeper understanding of the lived experiences, challenges, and perspectives of older adults in an aging society. Incorporating qualitative research approaches would enhance the richness and depth of the findings.

In a nutshell, our study contributes to the existing literature on population aging by providing insights into the demographic, economic, and social implications of an aging society. The findings align with previous research, highlighting the global trend of population aging, the economic challenges associated with healthcare expenditure, and the importance of social participation for the well-being of older adults. However, the study has limitations related to generalizability, and the reliance on quantitative analysis. Future research should address these limitations and consider incorporating qualitative research methods to further enhance our understanding of population aging and its multifaceted implications.

6. Conclusion

This study provides valuable insights into the demographic, economic, and social implications of population aging. By examining the trends and patterns in an aging society, we have contributed to the existing literature and expanded our understanding of this global phenomenon. Additionally, our research offers originality in terms of the specific country context and the comprehensive analysis of multiple dimensions of population aging.

The added value of our research lies in its ability to confirm and extend previous findings while shedding light on new aspects of population aging. We have reaffirmed the demographic shift towards an aging society, highlighting the increasing proportion of older adults in the population. Furthermore, our study has supported the existing literature's concerns about the economic impact of population aging, particularly in terms of healthcare expenditure. Additionally, we have emphasized the significance of social participation and its positive influence on the well-being of older adults.

The implications of our findings extend beyond academia and have relevance for policymakers and managers alike. The demographic trends observed in our study call for proactive policy responses to address the challenges and opportunities associated with population aging. Policymakers should focus on developing and implementing strategies that promote healthy aging, ensure access to quality healthcare services, and foster social inclusion. Moreover, our study underscores the importance of long-term planning and resource allocation to meet the evolving needs of an aging population.

From a managerial perspective, our research highlights the need for organizations to adapt and cater to the growing population of older consumers. Businesses should consider tailoring their products and services to meet the unique preferences and requirements of older adults. Additionally, fostering an age-friendly work environment and providing opportunities for lifelong learning and skill development can contribute to retaining and leveraging the talents and experience of older employees.

While this study has provided significant insights, there are avenues for future research that can build upon our findings. First, exploring the cultural and contextual factors that influence the implications of population aging across different countries and regions would provide a more comprehensive understanding of the phenomenon. Comparative studies that consider diverse sociopolitical and economic contexts would be valuable in this regard. Secondly, future research could focus on the subjective experiences and perspectives of older adults in an aging society. Qualitative research methods, such as interviews or focus groups, could provide a nuanced understanding of the challenges, aspirations, and needs of older individuals. This would enhance our ability to develop targeted

interventions and policies that truly address their concerns. Lastly, conducting longitudinal studies that track the changes and dynamics of population aging over time would contribute to a more nuanced understanding of this complex phenomenon. Such studies could provide insights into the long-term effects of policy interventions, societal changes, and technological advancements on the experiences and well-being of older adults.

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Declaration of Competing Interest

The author claims that the manuscript is completely original. The author also declares no conflict of interest.

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